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| 1. Divide a box with sweets among 11 students. If each student gets a fair share, in the student’s opinion, he has a value that is at least \_\_\_\_\_ of the total value of all sweets as assigned by that student.     |  |  |  | | --- | --- | --- | |  | a. | 11 % | |  | b. | 0.11 | |  | c. | 89 % | |  | d. |  |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 2. What of the following fair division methods can be applied only for two players?     |  |  |  | | --- | --- | --- | |  | a. | Divider–Chooser Method, Lone Divider–Chooser Method | |  | b. | Divider–Chooser Method, Method of Adjusted Winner | |  | c. | Method of Adjusted Winner, Knaster Inheritance Procedure | |  | d. | Method of Sealed Bids, Method of Adjusted Winner |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 3. Suppose a candlestick, watch, and porcelain service are to be divided among three people. The table shows the values (unknown to the others) that each person assigns for each item. Find a fair division of the items.     |  |  |  |  | | --- | --- | --- | --- | |  | **Candlestick** | **Watch** | **Porcelain service** | | **Player 1** | $700 | $300 | $500 | | **Player 2** | $600 | $500 | $300 | | **Player 3** | $300 | $300 | $400 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Player 1 – Candlestick, Player 2 – Watch, Player 3 – Porcelain service | |  | b. | Player 1 – Porcelain service, Player 2 – Watch, Player 3 – Candlestick | |  | c. | Player 1 – Watch, Player 2 – Candlestick, Player 3 – Porcelain service | |  | d. | Player 1 – Porcelain service, Player 2 – Candlestick, Player 3 – Watch |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 4. Mike and Tom divide a pizza that is one-half vegetarian and one-half not. Determine the false statement.     |  |  |  | | --- | --- | --- | |  | a. | Only Tom is a vegetarian. If the pizza is cut into such a way that both parts have a half of vegetarian and a half of not vegetarian, then a cut satisfies criterion 1 of a fair division problem. | |  | b. | Only Mike is a vegetarian. If the pizza is cut into such a way that one part is full vegetarian and another is full not vegetarian, then a cut doesn’t satisfy criterion 1 of a fair division problem. | |  | c. | Both Tom and Mike are vegetarians. If the pizza is cut into such a way that one part is one-third vegetarian and one-six not vegetarian, the other part is one-third not vegetarian and one-six vegetarian, then a cut satisfies criterion 1 of a fair division problem. | |  | d. | All statements are true. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 5. Each child got 20 sweets and was offered to distribute them between the toys. The table shows the distribution. Which division is not fair?     |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **Doll** | **Puzzle** | **Robot** | **Teddy bear** | | **Child 1** | 6 | 2 | 6 | 6 | | **Child 2** | 4 | 6 | 4 | 6 | | **Child 3** | 8 | 2 | 8 | 2 | | **Child 4** | 2 | 4 | 6 | 8 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Child 1 – Doll, Child 2 – Puzzle, Child 3 – Robot, Child 4 – Teddy bear | |  | b. | Child 1 – Teddy bear, Child 2 – Doll, Child 3 – Robot, Child 4 - Puzzle | |  | c. | Child 1 – Robot, Child 2 – Puzzle, Child 3 – Doll, Child 4 – Teddy bear | |  | d. | Child 1 – Teddy bear, Child 2 – Puzzle, Child 3 – Doll, Child 4 – Robot |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 6. Kate and Mary have a cake that has one-half milk chocolate icing and one-half dark chocolate icing. Both of the girls like all kinds of chocolate. Which cut is not fair?     |  |  |  | | --- | --- | --- | |  | a. | ​ | |  | b. | ​ | |  | c. | ​ | |  | d. | All cuts would be fair. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 7. David and Nick were roommates in a dormitory and after graduation need to divide 5 vinyl records. They decided to use the adjusted winner method, and the table shows the points they assigned to each record. Which division is fair?     |  |  |  | | --- | --- | --- | |  | **David** | **Nick** | | **The Beatles** | 25 | 25 | | **Frank Sinatra** | 10 | 5 | | **Michael Jackson** | 15 | 25 | | **Rolling Stones** | 25 | 15 | | **Elvis Presley** | 15 | 5 |   ​   |  |  |  | | --- | --- | --- | |  | a. | David - The Beatles, Rolling Stones; Nick - Frank Sinatra, Michael Jackson, Elvis Presley | |  | b. | David - Rolling Stones, Elvis Presley; Nick - The Beatles, Frank Sinatra, Michael Jackson | |  | c. | David - Frank Sinatra, Rolling Stones, Elvis Presley; Nick - The Beatles, Michael Jackson | |  | d. | David - Frank Sinatra, Rolling Stones; Nick - The Beatles, Michael Jackson, Elvis Presley |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 8. Rachel and Rebecca need to divide 5 dishes. They decided to use the adjusted winner method, and the table shows the points they assigned to each item. Which division is not fair?     |  |  |  | | --- | --- | --- | |  | **Rachel** | **Rebecca** | | **Bowl** | 12 | 15 | | **Cup** | 6 | 3 | | **Pan** | 9 | 15 | | **Teapot** | 9 | 9 | | **Plate** | 9 | 3 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Rachel - the cup, the teapot, the plate, and 22.2% of the value of the bowl; Rebecca - the pan and 77.8% of the value of the bowl | |  | b. | Rachel - the cup, the teapot, the plate, and 22.2% of the value of the pan; Rebecca – the bowl and 77.8% of the value of the pan | |  | c. | Rachel - the cup, the teapot, the plate, and 25% of the value of the pan; Rebecca – the bowl and 75% of the value of the pan | |  | d. | Rachel - the cup, the teapot, the plate, and 25% of the value of the bowl; Rebecca – the pan and 75% of the value of the bowl |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 9. Paul and Frank need to divide devices. They use the adjusted winner method, and the table shows the points they assigned to each item. The value of which device should be divided equally to make a fair division?     |  |  |  | | --- | --- | --- | |  | **Paul** | **Frank** | | **Smartphone** | 15 | 25 | | **Tablet** | 15 | 15 | | **Laptop** | 20 | 30 | | **Power bank** | 10 | 5 |   ​   |  |  |  | | --- | --- | --- | |  | a. | The smartphone | |  | b. | The tablet | |  | c. | The laptop | |  | d. | None of them |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 10. Sarah and Monika need to divide accessories. They decided to sell a scarf and to share its value. What percent of the value will each of the girls get?     |  |  |  | | --- | --- | --- | |  | **Sarah** | **Monika** | | **Scarf** | 14 | 28 | | **Gloves** | 28 | 21 | | **Handbag** | 28 | 35 | | **Sunglasses** | 21 | 7 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Sarah gets 25%, and Monika gets 75%. | |  | b. | Sarah gets 33%, and Monika gets 67%. | |  | c. | Sarah gets 50%, and Monika gets 50%. | |  | d. | Sarah gets 67%, and Monika gets 33%. |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 11. Three items will be divided among three people. The bids for each of the items are given in the table. Find a fair division of the items.     |  |  |  |  | | --- | --- | --- | --- | |  | **Sonya** | **Bob** | **Michelle** | | **Item 1** | $70 | $20 | $10 | | **Item 2** | $30 | $50 | $70 | | **Item 3** | $40 | $70 | $60 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Everyone gets one item, and Sonya pays $23.33 into a joint account, Bob pays $23.33 into a joint account, Michelle gets $23.33 from a joint account. | |  | b. | Everyone gets one item, and Sonya gets $23.33 from a joint account, Bob gets $23.33 from a joint account, Michelle pays $23.33 into a joint account. | |  | c. | Everyone gets one item, and Sonya pays $23.33 into a joint account, Bob gets $23.33 from a joint account, Michelle pays $23.33 into a joint account. | |  | d. | Everyone gets one item without any additional payments. |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 12. Some furniture will be divided among three people. The bids for each of the items are given in the table. Find a fair division of the items and determine the values of additional payments.     |  |  |  |  | | --- | --- | --- | --- | |  | **Lina** | **Victor** | **Barbara** | | **Ottoman** | $150 | $30 | $60 | | **Armchair** | $150 | $240 | $210 | | **Sideboard** | $210 | $60 | $90 | | **Coffee table** | $120 | $120 | $180 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Lina pays $70 into a joint account; Victor pays $10 into a joint account; Barbara gets $80 from a joint account. | |  | b. | Lina gets $70 from a joint account; Victor gets $10 from a joint account; Barbara pays $80 into a joint account. | |  | c. | Lina pays $80 into a joint account; Victor pays $10 into a joint account; Barbara gets $70 from a joint account. | |  | d. | All values of additional payments are incorrect. |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 13. 8 players submit sealed bids for each item. According to the Knaster inheritance procedure, which value does the player submitting the highest bid place into a joint account?     |  |  |  | | --- | --- | --- | |  | a. | of the value of the object. | |  | b. | The bid he submits multiplied by 8. | |  | c. | of the value of the object. | |  | d. | The bid he submits divided by 8. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 14. Use the table and the Knaster inheritance procedure to distribute the picture among three siblings.     |  |  |  |  | | --- | --- | --- | --- | |  | **Tony** | **Lora** | **Simon** | | **Bids for the picture** | $600 | $2400 | $1080 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Each person gets $1360. | |  | b. | Tony gets $760, Lora pays $1040, Simon gets $280. | |  | c. | Tony gets $280, Lora gets the picture and pays $720, Simon gets $440. | |  | d. | Tony gets the picture and pays $600 to Lora and Simon. |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 15. Use the table and the Knaster inheritance procedure to distribute the antique chest among four siblings.     |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **Will** | **Mary** | **George** | **Anna** | | **Bids for the chest** | $720 | $480 | $2400 | $1680 |   ​   |  |  |  | | --- | --- | --- | |  | a. | Will gets the chest and pays $450, Mary gets $390, George gets $1530, Anna gets $690. | |  | b. | Will gets $450, Mary gets $390, George gets the chest and pays $1530, Anna gets $690. | |  | c. | Will gets $450, Mary gets the chest and pays $390, George gets $1530, Anna gets $690. | |  | d. | Will gets $450, Mary gets $390, George gets $1530, Anna gets the chest and pays $690. |  |  |  | | --- | --- | | *ANSWER:* | b | |